Global Hydrology Resource Center

Data User Guide

GPM Ground Validation NOAA CPC Morphing Technique (CMORPH) IFloodS, IPHEx

Introduction

The GPM Ground Validation NOAA CPC Morphing Technique (CMORPH) IFloodS dataset includes global precipitation analyses data that have been selected for the GPM Iowa Flood Studies (IFloodS) which took place in eastern Iowa from May 1 to June 15, 2013. The GPM Ground Validation NOAA CPC Morphing Technique (CMORPH) IPHEx dataset includes global precipitation analyses data that have been selected for the GPM Integrated Precipitation and Hydrology Experiment (IPHEx) which took place in North Carolina during the months of April-June 2014. These ancillary datasets are originally produced by NOAA's Climate Prediction Center. CMORPH is a technique which uses precipitation estimates from low orbiter satellite microwave observations to produce global precipitation analyses at high temporal and spatial resolution. Both datasets are available in netCDF and raw binary data formats.

Citations

Joyce, R. 2013. GPM Ground Validation NOAA CPC Morphing Technique (CMORPH) IFloodS [indicate subset used]. Dataset available online [https://fcportal.nsstc.nasa.gov/pub/gpm_validation/ifloods/CMORPH/] from the NASA EOSDIS Global Hydrology Resource Center Distributed Active Archive Center, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/GPMGV/IFLOODS/CMORPH/DATA201

Joyce, R. 2014. GPM Ground Validation NOAA CPC Morphing Technique (CMORPH) IPHEx [indicate subset used]. Dataset available online [https://fcportal.nsstc.nasa.gov/pub/gpm_validation/iphex/CMORPH/] from the NASA EOSDIS Global Hydrology Resource Center Distributed Active Archive Center,

Huntsville, Alabama, U.S.A. doi:
http://dx.doi.org/10.5067/GPMGV/IPHEX/CMORPH/DATA201

Keywords:

Precipitation amount, Precipitation rate, Precipitation anomalies, Rain

Campaigns

The Iowa Flood Studies (IFloodS) campaign was a ground measurement campaign that took place in eastern Iowa from May 1 to June 15, 2013. The goals of the campaign were to collect detailed measurements of precipitation at the Earth's surface using ground instruments and advanced weather radars and, simultaneously, collect data from satellites passing overhead. The ground instruments characterized precipitation -- the size and shape of raindrops, the physics of ice and liquid particles throughout the cloud and below as it falls, temperature, air moisture, and distribution of different size droplets -- to improve rainfall estimates from the satellites, and in particular the algorithms that interpret raw data for the Global Precipitation Measurement (GPM) mission's Core Observatory satellite, which launched in 2014. More information about IFloodS is available at http://gpm.nsstc.nasa.gov/ifloods/.

The GPM Integrated Precipitation and Hydrology Experiment (IPHEx) was held in North Carolina during the months of April-June 2014. The goal of IPHEx was to characterize warm season orographic precipitation regimes and the relationship between precipitation regimes and hydrologic processes in regions of complex terrain. The IPHEx campaign was part of the development, evaluation, and improvement of remote-sensing precipitation algorithms in support of the GPM mission through NASA GPM GV field campaign (IPHEX_GVFC) and the evaluation of Quantitative Precipitation Estimation (QPE) products for hydrologic forecasting and water resource applications in the Upper Tennessee, Catawba-Santee, Yadkin-Pee Dee, and Savannah river basins (IPHEX-HAP, H4SE). NOAA Hydrometeorology Testbed (HTM) has synergy with this project. More information about IPHEx is available here http://gpm.nsstc.nasa.gov/iphex/.

CMORPH Technique

The CPC Morphing Technique, or CMORPH, is a technique which uses precipitation estimates from low orbiter satellite microwave observations to produce global precipitation analyses at high temporal and spatial resolution. The precipitation estimates are derived from the following passive microwave instruments:

Instrument	Platform
SSM/I	DMSP 13, 14, 15
AMSU-B	NOAA-15, 16, 17, 18
AMSR-E	AQUA

TMI	TRMM

These estimates are generated by algorithms of Ferraro (1997) for SSM/I, Ferraro et al. (2000) for AMSU-B and Kummerow et al. (2001) for TMI. Note that this technique is not a precipitation estimation algorithm but a means by which estimates from existing microwave rainfall algorithms can be combined (Source: http://www.cpc.ncep.noaa.gov/products/janowiak/cmorph_description.html).

The CMORPH raw data is generated in near real-time and is available at several different spatial and temporal resolutions. Both the IFloodS and IPHEx CMORPH datasets include the 30 minute estimates at approximately 0.0727 lat/lon spatial resolution (or 8 kilometers at the equator). The data provides global coverage (60 degrees south – 60 degrees north).

More detailed information on the CMORPH methodology can be found in the following publication:

Robert J. Joyce, John E. Janowiak, Phillip A. Arkin, and Pingping Xie, 2004: CMORPH: A Method that Produces Global Precipitation Estimates from Passive Microwave and Infrared Data at High Spatial and Temporal Resolution. *J. Hydrometeor*, **5**, 487–503. doi: http://dx.doi.org/10.1175/1525-7541(2004)005<0487:CAMTPG>2.0.CO;2

The IFloodS CMORPH dataset also includes the bias corrected (CRT) data. The bias corrected data adjusts the daily CMORPH satellite estimates against a daily gauge analysis. More information on the bias corrected methodology can be found at ftp://ftp.cpc.ncep.noaa.gov/precip/CMORPH_V1.0/REF/EGU_1104_Xie_bias-CMORPH.pdf

Investigators

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File Naming Convention

IFloodS

The GPM Ground Validation NOAA CPC Morphing Technique (CMORPH) IFloodS dataset includes the near real-time raw data from NOAA in both binary and netCDF converted data.

The files are named as follows:

Binary format:

CMORPH_V1.0_RAW_8km-30min_YYYYMMDDHH.bz2

Where,

CMORPH = the CPC Morphing Technique
V1.0 = the version of the data
8km-30min = the spatiotemporal resolution of the data
YYYYMMDDHHMM = the year, month, day, and hour of the data file
bz2 = a compressed file format used by BZip 2

netCDF format:
ifloods_CMORPH_RAW_YYYYMMDDHHMM.nc

Where,

ifloods = Iowa Flood Studies field campaign
CMORPH = the CPC Morphing Technique
RAW = near real-time data
YYYYMMDDHHMM = the year, month, day, hour, and minutes of the data file
nc = netCDF format

The IFloodS CMORPH dataset also includes the bias corrected (CRT) data.

These files are named as follows:

Binary format:
CMORPH_V1.0_ADJ_8km-30min_YYYYMMDDHH.bz2

Where,

CMORPH = the CPC Morphing Technique
V1.0 = the version of the data
ADJ = bias corrected CMORPH data
8km-30min = the spatio-temporal resolution of the data
YYYYMMDDHH = the year, month, day and hour of the data file
bz2 = a compressed file format used by BZip 2

netCDF format:
ifloods_CMORPH_CRT_YYYYMMDDHHMM.nc

Where,

ifloods = Iowa Flood Studies field campaign
CMORPH = the CPC Morphing Technique
CRT = bias corrected CMORPH data
YYYYMMDDHHMM = the year, month, day, hour, and minutes of the data file
nc = netCDF format

IPHEx

The GPM Ground Validation NOAA CPC Morphing Technique (CMORPH) IPHEx dataset includes the near real-time raw data from NOAA in both binary and netCDF converted data.

Binary format:
advt-8km-interp-prim-sat-spat-2lag-2.5+5dovlp8kmIR-YYYYMMDDHH.Z

Where,

advt-8km-interp-prim-sat-spat-2lag-2.5+5dovlp8kmIR = indicates the raw near real-time CMORPH data for the 30 minute estimates at approximately 8 km resolution
YYYYMMDDHH = the year, month, day and hour of the data file
Z = compressed file format

netCDF data:
iphex_CMORPH_YYYYMMDDHHMM.nc

Where,

iphex = Integrated Precipitation & Hydrology Experiment
CMORPH = the CPC Morphing Technique
YYYYMMDDHHMM = the year, month, day, hour and minute of the data file
nc = netCDF format

Data Format Description

The original data from NOAA's Climate Prediction Center is available in binary format. For IPHEx, these files are compressed using the standard Unix compress function and have a suffix of .Z. A program written by NOAA for these files can be accessed here: ftp://ftp.cpc.ncep.noaa.gov/precip/global_CMORPH/README.cmorph.8km_30minute. The IFloodS files are compressed via format used by BZip 2 and have a suffix of .bz2.

The CMORPH data for both campaigns has also been converted to netCDF (.nc) format and is available for download. While the binary files are available for download in hourly increments, the netCDF files have been made available in 30 minute increments. The binary files contain two sets of data in each file (one for minutes 0 – 29 and another for minutes 30 -59). The netCDF files are therefore converted representations of the binary files into 30 minute increments instead of hourly increments.

References

Ferraro, R. R., 1997: SSM/I derived global rainfall estimates for climatological applications. J. Geophys. Res., 102, 16715-16735.

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Joyce, R., J. E. Janowiak, P. A. Arkin, and P. Xie, 2004: CMORPH: A Method that Produces Global Precipitation Estimates from Passive Microwave and Infrared Data at High Spatial and Temporal Resolution. *J. Hydrometeor*, **5**, 487–503. doi: http://dx.doi.org/10.1175/1525-7541(2004)005<0487:CAMTPG>2.0.CO;2

Kummerow, C., Y. Hong, W. S. Olson, S. Yang, R. F. Adler, J. McCollum, R. Ferraro, G. Petty, D-B Shin, and T. T. Wilheit, 2001: Evolution of the Goddard profiling algorithm (GPROF) for rainfall estimatin from passive microwave sensors. J. Appl. Meteor., 40, 1801-1820.

Contact Information

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